ASSESSMENT OF EXPOSURE TO CIGARETTE SMOKE: PILOT STUDY RESULTS FOR CARBON MONOXIDE AND SEVERAL BIOMARKERS OF POTENTIAL HARM

R.D. Kinser[1], B.L. Nelson[1], H.-J. Roethig[1], R.-A. Walk[1], J. Oey[1], A.R. Tricker[2], D.E. Leyden[3]

[1]*Philip Morris U.S.A., Richmond, VA;* [2]*Philip Morris Products SA, Neuchatel, Switzerland;* [3]*Hartfield, VA, USA*

This pilot study was conducted to aid in the development of the experimental design for a study of exposure of adult smokers in the U.S. to selected cigarette smoke constituents. A secondary objective of the pilot study was to explore the feasibility of analysis and utility of the measurements of several biomarkers of potential harm. Standard clinical chemistry methods were utilized in all analyses.

The study included 69 adult smokers of any brand of 3.0 – 6.9 mg tar yield (FTC method) manufactured cigarettes and 66 non-smokers. For assessment of exposure levels of carbon monoxide, CO in exhalate and carboxyhemoglobin were measured on weeks 1, 2, 3 and 6 of the six-week pilot study. The average level of CO in the exhalate of smokers over was 25.3 ppm ± 14.4, while that for non-smokers was 5.6 ppm ± 1.8. These differences are statistically significant with a $p \leq 0.001$. The mean carboxyhemoglobin levels over the same timeframe were 4.3% ± 2.8 for smokers and 0.6% ± 0.4 for non-smokers. These differences are also statistically significant with a $p \leq 0.001$.

Biomarkers of potential harm, which were studied, the health effect they represent, and average results are summarized in the table below.

From these data, we conclude that 1) the carboxyhemoglobin measurement provides an acceptable measure of CO exposure and avoids a sample collection time requirement that would be difficult to achieve in a large study; 2) overall values for 11-dehydrothromboxane B_2 and 8-epi-prostaglandin $F_{2\alpha}$ indicate that there is a statistically significant difference between smokers and non-smokers; and 3) maliondialdehyde in urine does not distinguish between smokers of 3.0 – 6.9 mg tar yield (FTC method) cigarettes and non-smokers.

Biomarker	Health Effect	Smoker	Non-smoker	p
11-dehydrothromboxane B_2	Thrombosis, platelet activation	1023.3 ± 464.6 ng/mg creatinine	766.0 ±274.1 ng/mg creatinine	≤0.001
8-epi-prostaglandin $F_{2\alpha}$	Lipid peroxidation; atherosclerosis	1927.1 ± 936.1 ng/mg creatinine	1140.0 ± 369.0 ng/mg creatinine	≤0.001
malondialdehyde	Oxidative stress	0.002 ± 0.0009 µg/mg creatinine	0.002 ± 0.0010 µg/mg creatinine	

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